

INVESTIGATING THE ASSOCIATION BETWEEN MOTOR
PROFICIENCY AND BODY SATISFACTION IN GRADE 5 CHILDREN

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ABSTRACT

The inverse relationships between motor proficiency and overweight, and between overweight and body satisfaction have been well documented. However, the association between motor proficiency and body satisfaction has been largely neglected in the literature. Knowledge of the influence that low motor proficiency may have on body satisfaction is essential if the full burden that those children with poor motor abilities face is to be fully recognized, as low body satisfaction has been linked to an increased risk for low self-esteem, depression, and disordered eating.

The cohort investigated in this report included 1907 (971 males, 936 female) Grade 5 students from the Physical Health Activity Study Team (PHAST) project in the Niagara Region of Southern Ontario. Children were grouped as overweight or healthy weight (using BMI cut offs for age and gender), and as low motor proficiency or normal motor proficiency (cut-off set at lowest 10% Bruininks Oseretsky Test of Motor Proficiency-short form (BOTMPsf)).

It was apparent from analyses of variance (ANOVAs) by gender that boys demonstrated significantly higher motor proficiency scores. As a result separate multiple logistic regressions by gender were used to determine the relationship between body satisfaction, BMI, and motor proficiency. There was a significant relationship between BMI and body satisfaction for both genders ($p < 0.01$) and for males a significant relationship between motor proficiency and body satisfaction

($p < 0.03$). Overweight females were less likely to be satisfied with their bodies with an odds ratio (OR) of 0.33 (CI: 0.23-0.47). The same trend was found in overweight males (OR: 0.42, CI: 0.29-0.59). Males with low motor proficiency were significantly less satisfied with their bodies (OR: 0.53, CI: 0.29-0.97). Males with poor motor proficiency were at greater risk for low body satisfaction regardless of their overweight status.

Overweight is known to be prevalent among children with low motor proficiency and, these results indicate that low body satisfaction is also a significant concern. These findings confirm that attention needs to be paid to perceptions of body satisfaction among children with low motor proficiency. This is particularly true for boys, as their bodies may fail them in two common societal expectations, shape and skill and for whom their risk of low body satisfaction is heightened by their poor motor proficiency.

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Chapter I: Introduction

There is little debate that the prevalence of childhood obesity is steadily increasing among Canadian children. The rapid rise in the prevalence of childhood obesity in Western societies has been well established (Allen, Byrne, Blair, Davis, 2005). In the 1978/1979 Canadian Community Health Survey (CCHS) 12% of 2- to 17-year-olds were overweight and 3% were obese. In 2004 the overweight and obese rates for this age group were 18% and 8% respectively (Statistics Canada, 2005). Awareness is high and the issue is a major target for public health campaigns, clinicians and researchers. This awareness and concern has led to significant efforts to raise the knowledge of both children and adults regarding the increased risk of Type 2 diabetes, heart disease, and metabolic syndrome as a result of being overweight (Grundy, Hansen, Smith, James, Cleeman, Kahn, 2004). These messages concerning the need to develop and maintain a healthy weight go hand in hand with the promotion of an ideal body from a wide array of sources. The common theme from both avenues is the need to lose weight either through changes in diet or physical activity patterns. Absent from the focus on decreasing the risk for metabolic syndrome, heart disease, and Type 2 diabetes by reducing overweight is a concern over the potential impact of these health messages on the perceived body image of children. Body image is influenced to a large extent by cultural values and mass-media representations of the ideal body (Grogan, 2008). Public health campaigns contribute both to cultural values and to the mass media representation of the

ideal body. Pursuit of the ideal body has been linked to disordered eating patterns, especially among adolescent girls.

Factors that affect body image among adolescents have been widely examined. However, the exploration of body image in younger children has been neglected in the literature. Numerous factors such as various anthropometric measures, socioeconomic status, physical activity participation, and self-efficacy have been examined for their affect on body satisfaction (Duncan et al., 2005; O'Dea & Caputi, 2001; Hay, 1992). The increased risk of overweight among children with poor motor abilities as been established and, although largely unexplored, it is reasonable to hypothesize that low motor proficiency may be associated with low body satisfaction due to lower levels of physical activity and decreased generalized self-efficacy toward physical activity. Both of these factors may have a distal effect on body satisfaction by contributing to increased body size, which is the primary proximal factor associated with body satisfaction. Higher BMI, which is known to be negatively associated with body satisfaction, is affected by factors such as decreased physical activity and low generalized self-efficacy toward physical activity, both of which have been established among children with low motor proficiency (Field et al., 2001; Duncan et al., 2005; Gustafson Larson & Terry, 1992; Cairney, Hay, Faught, Mandigo & Flouris, 2005; Hay, 1992). What has not been established is whether poor motor proficiency has an independent effect on body satisfaction apart from its effect on BMI. In other words is poor motor proficiency another proximal factor with a direct effect on body satisfaction.

As mentioned previously, the relationship between motor proficiency and body satisfaction has not been examined, but it is plausible to hypothesize that it would be positively associated with body satisfaction. Body satisfaction has largely been concerned with issues of body shape and size, but it is plausible that one's ability to move their body effectively and efficiently may also play a role. This potential influence on body satisfaction and treating motor proficiency as a potential proximal contributor has not been examined.

Understanding of the influence of motor proficiency on body image in young children, and how this differs between males and females is crucial for developing effective and safe public health campaigns for children. While the concern about overweight is well justified, interventions need to be developed informed of the potential ramifications on a child's life beyond that of the main outcome of interest. The potential effects on body satisfaction, and how these might differ between sub-groups, must be considered. This thesis is an effort to begin the process of investigating the independent effect that low motor proficiency may have on body satisfaction, recognizing that differences in this relationship may exist between genders.

1.1 Objective

To determine the association between motor proficiency and body satisfaction in male and female children controlling for differences in overweight status and age.

This study was approved by the Research Ethics Board of both Brock University and the District School Board of Niagara (DSBN).

Chapter II: Review of Literature

2.1 Body Image and Ideal Weight

Body image is a multifaceted construct comprised of cognitive, affective, and behavioural components. Within this construct, body satisfaction is considered the affective component of body image, describing how an individual feels about their body (Greaves, Williamson, Eberenz, Sebastian & Barker, 1995). Body satisfaction is usually conceptualized as a continuum ranging from poor to excellent. However, cut points are commonly adopted in order to classify an individual as either satisfied or dissatisfied. Body satisfaction among adolescents has been widely studied. Paralleling the increased prevalence of obesity there has been a rise in the number of individuals with poor body satisfaction in the adolescent population (Baur, 2002). It is reported that half of 8-to-13-year-old girls have concerns about their weight (Davison, Markey, & Birch, 2003). Considerable body image concerns have also been reported among pre-adolescent boys and girls (Duncan, Woodfield, O'Neill & Al-Nakeeb, 2002). Body dissatisfaction often persists into adolescence and adulthood and has been considered a risk factor for the development of depression, low self-esteem, and eating disorders. At this time however, investigations to help understand and identify correlates and potential causes of low body satisfaction, particularly motor proficiency, in pre-adolescents have been neglected.

As the 'ideal figure' differs between males and females, there may be different factors that make each gender more susceptible to developing poor body image (Field et al., 2000). Societal expectations of what one is able to "do" with their bodies (e.g. sports) also differ between genders. Therefore, when

examining how motor proficiency is associated with body satisfaction in young children, it is necessary to consider how it may affect males and females differently.

A strong positive relationship has been identified between BMI and body satisfaction among adolescents (Sujoldze & De Lucia, 2007). However, this relationship has not been studied to any great degree in children. The impact of BMI on body satisfaction has been shown to differ between genders. Several studies have found that adolescent and adult females are much more concerned about their weight and shape leading to increased levels of body dissatisfaction (Field et al., 2001; Duncan et al., 2005; Gustafson, Larson & Terry, 1992). Adolescent and adult males do not appear to be as concerned about their body mass, regardless of their true weight status. Prior to the present study, the effect of motor proficiency on body satisfaction has not been reported.

2.2 Methods of Measuring Body Image

There is no clear gold standard for measuring body satisfaction. Several different methods have been used to measure body image, including the use of figures and questionnaires.

Duncan et al. (2006) and Welch et al. (2004) used the Stunkard, Sorensen & Schulsinger (1983) figure rating scale, which is suitable to assess body dissatisfaction as young as 11 years old. Children select the figure they think they most look like and the one they would most like to look like. The difference between current and ideal body size is then used as a measure of body satisfaction. Robinson et al. (2001) also used figures to determine a child's body

satisfaction. The authors used the Kids' Eating Disorders Survey (KEDS) gender-specific child figures. Body dissatisfaction in this study was determined through the same method as the Stunkard et al. (1983) figure rating scale. Another method using figures is the Children's Body Image Scale (CBIS), which was used by Allen et al. (2006). The CBIS uses photographs of Australian children of known BMI and there is a separate scale for boys and girls. Children select the figures that best represent their current and ideal body sizes and the perceived-ideal discrepancy provides a measure of body satisfaction. This scale has been validated on an Australian sample of 7-12 year old boys and girls (Truby & Paxton, 2002). There are disadvantages to using figures when determining body satisfaction. If the figures are not silhouettes, children of a different race than the pictures may not feel the figures resemble them. Also, the figures do not take into account BMI.

Davison et al. (2003) used the Body Esteem Scale with 5-9 year old girls. This is a 24-item scale that assesses overall body satisfaction through questions. According to Mendelson & White (1982) this scale is suitable for use with young children. An unnamed questionnaire was used by O'Dea & Caputi (2001). This questionnaire, which had been found reliable for use among adolescents in a pilot study, scored body image questions (too fat=3, about right=2, too thin=1). While Davison et al. (2003) assesses overall body satisfaction, Downs, DiNallo, Savage & Davison(2007) had adolescents rate the degree of satisfaction with specific body parts (e.g., face, thighs) using a five-point Likert scale. This was done with the Body Areas Satisfaction Scale (BASS), which is a 9-item subscale

of the Multidimensional Body Self-Relations Questionnaire. Using a scale rather than Yes/No answers allows children to give a more accurate description of how they actually feel about their bodies. The internal consistency of this test was good ($\alpha=0.85$).

Social desirability is a factor must be considered when examining the influence of weight status on body image. Children will often claim to perceive themselves in a way they feel is the socially desirable norm. Welch, Gross, Bronner, Dewberry-Moore & Paige (2004) found that regardless of weight status, most children selected the same figure to represent what they believe is their current size. They were not necessarily accurate in their selections, but selected the image they felt they should pick. This highlights a disadvantage when using images to evaluate body image.

2.3 Methods of Measuring Motor Proficiency

There are various methods employed to measure motor proficiency. Among the most common are the Bruininks-Oseretsky Test of Motor Proficiency (BOTMP), the Movement Assessment Battery for Children (MABC), and the Test of Gross Motor Development (TGMD).

The BOTMP is a standardized, norm-referenced measure. It is an individually administered test that assesses the motor functioning of children aged 4.5-14.5 years of age and is the most commonly used screening tool to diagnosis children with poor motor proficiency in North America (Crawford, Wilson & Dewey, 2001). The complete battery consists of eight subtests comprising 46 different items. Four of the subtests measure gross motor skills,

three measure fine motor skills, and one measures both gross and fine motor skills (Duger, Bumin, Uyanik, Asi & Kayihan, 1999). The test is a measure to characterize motor proficiency, specifically in the areas of fine manual control, manual coordination, body coordination, and strength and agility (Deitz, Kartin & Kopp, 2007). Bruininks (1978), states that the BOTMP Long Form (LF) provides a complete index of motor proficiency as well as separate measures of gross and fine motor skills. There is also a Short Form (SF), which consists of 14 items from the full battery that provides a brief summary of general motor proficiency. The SF has been validated against the LF with inter-correlations between .90 and .91 for children between the ages of 8 and 14.

The MABC is a test of motor competence that assesses fine and gross motor coordination. It is designed to identify and describe impairments in motor performance of children and adolescents three to 16 years of age. It provides a standardized quantitative and qualitative evaluation of a child's motor competence relative to tasks required in daily life. The three categories of tests include manual dexterity, ball skills, and static and dynamic balance. The minimum test-retest reliability at any age is 0.75 and inter-rater reliability of 0.70 (Henderson & Sugden 1992; Tan, Parker & Larkin, 2001). However, there are limited reliability and validity studies that have been done on the MABC and the MABC-2.

The TGMD was developed to assess motor skills normally taught in physical education classes to children three to 10 years of age (Wiarth & Darrah, 2001). It is composed of 12 fundamental movement skill items, which are divided

into two subtests: locomotion and object control. This test was originally developed with the objective to meet the needs of teachers responsible for delivering motor skill instruction to children with physical disabilities (Ulrich, 1984). The reliability estimate of this test is .78 for children without physical disabilities and .62 for those with physical disabilities.

2.4 The Relationship between Body Composition and Body Satisfaction

A consequence of the obesity epidemic has been increased attention placed on weight by health promotion campaigns. This may result in more children striving for the “ideal figure”, which is largely influenced by the media. Associated with this rise in prevalence is an increase in the number of children with decreased body satisfaction (Mills & Adrianopoulos, 1993). To date, the majority of research addressing the obesity epidemic and subsequent decrease in body satisfaction has focused on adolescents with little examining children. Therefore, the majority of studies presented in this review will provide evidence gleaned from adolescent populations.

Sujoldzie & De Lucia (2007) found a strong negative relationship between BMI and body satisfaction among adolescents. This cross-sectional study examined a cohort of 2000 European adolescents between the ages of 15 and 18 years. The authors note that having a poor body image is a concern, as adolescents often become focused on their physical appearance and any deviation from the ideal figure can lead to several harmful behaviours: dieting, social withdrawal, poor self-esteem, and increased health vulnerability. While a strength of this study was its relatively large sample size of 1907 participants, it

was a cross-sectional study, which does not allow changes to be evaluated over time. Further, the participants in this study are adolescents, a time in which poor body satisfaction may already be present to a large degree.

According to Allen et al. (2005) the negative effects of obesity and poor body image include low self-esteem, body dissatisfaction and depression. Their study was the first to look at the associations between weight status, weight and shape concern, self-esteem, body dissatisfaction and depression in young children. The authors recommend that weight interventions and other programs designed to improve an individual's body image be started at an early age. Allen et al. (2005) obtained cross-sectional data from the Australian Childhood Growth and Development (GAD) study. The GAD study is a population-based cohort study that is tracking overweight and healthy weight children over at least three years. The cross-sectional data used by Allen et al. (2005) involved children 7 to 13 years of age (n=207) from the metropolitan area of Perth, Australia who completed assessments during the first year of the study. All children completed the same assessments. They found that BMI and body satisfaction were only significantly and negatively related among participants who rated BMI as important. It is not the weight status per se that causes children to have a poor body image, but rather the degree to which they are concerned about their weight and shape. The results from this study suggest that with early detection of poor body image, appropriate interventions can be put in place to increase the number of children who are satisfied with their bodies. This study is useful in that the population studied included children, rather than only adolescents. This was

a cross-sectional study so it cannot determine how one's body satisfaction changes over time. This study also provides evidence that factors beyond weight influence body satisfaction.

A longitudinal study completed by Davison et al. (2003), examined 5-9 year old non-Hispanic white girls from central Pennsylvania. They observed that girls who reported poor body image or low body satisfaction at ages 5-7 years were more likely to be dieting by the age of nine, regardless of their BMI. An interesting finding in this study was that there was an overall decrease in girl's mean weight concerns and body dissatisfaction across ages five to nine years. However, it is unclear if this was reflective of a true decrease either in weight concern or body dissatisfaction. It is equally plausible that after repeated testing, the participants became more conscious of the assessments and were more inclined to provide socially desirable responses (Davison et al., 2003).

It might be assumed that as a child's weight increases so does the likelihood they will develop a negative body image. However it has been found, particularly in females, that many children report low body satisfaction when their true weight status is not necessarily above or below average. Rolland, Farnill & Griffiths (1996) conducted a study involving 244 children aged between eight and 12 years of age. The children's height and weight were measured and the children indicated their current and ideal body sizes. Among the children who were categorized as overweight, 76% of girls and 56% of boys wanted to be thinner, whereas in the underweight group 10% of girls and no boys wanted to be thinner. The desire of overweight children to be thinner is understandable, yet

the desire of underweight girls to be thinner is concerning. This is consistent with the findings of O'Dea & Caputi (2001). O'Dea & Caputi found that among their population of 6-19 year olds, 40% were overweight, yet 80% were trying to lose weight. Hay, Hawes, Faight, Cairney & Klentrou (2001) reported that regardless of actual body fat, girls are much more likely to want to lose weight than boys. Boys were as likely to want to gain as to lose weight. This again points to the fact that there are reasons other than weight alone leading to one's poor body image.

It is important to recognize that gender differences exist in the association between body composition and body satisfaction. Most studies have reported significantly higher levels of concern with body image in females, such as those results reported by Field et al., 2001, in which they used primarily adolescent participants (9-14). While Allen et al. (2006) hypothesized that girls would report higher levels of weight and shape concern than boys; they did not find significant gender differences in weight and shape concern. However, Allen et al. (2006) had a younger age range of 7-13. This may indicate that differences in concern over body image may become stronger with age and that the participants in Allen's study were too young for gender differences to be observed. It is also possible that the methods used to determine body image satisfaction were not sensitive enough to detect body dissatisfaction in a younger population.

While weight concerns are more prevalent in girls regardless of overweight status, weight concerns in boys, while less common, are more strongly related to their BMI (Field, 2001; Grogan, 1999) Therefore, boys appeared more physically

located in their concerns with body image, whereas girls often expressed concerns regardless of their actual BMI. While these results are interesting, this study was limited as BMI was calculated using self-reported height and weight.

Duncan, Al-Nakeeb, Nevill, & Jones (2005), studied 266 children 11-14 years of age, from white (n=176), black (n=33), and Asian (n=67) groups. They found that across all groups, boys reported significantly less body dissatisfaction and higher levels of physical activity. Body fat was also lower in boys. This study examined older children and again, may be indicative of the fact that gender differences emerge with increasing age.

Lunde, Frisen & Hwang (2007) found that among 874 10-year-olds, weight was a significant concern for females and often was the main contributor to low body satisfaction, yet that was not always the case for males. The authors found that boys who reported themselves as too short often believed that others were critical of their bodies. Indeed, short stature is the opposite of the male ideal body, which is characterized by a physically fit and fairly tall body build (Grogan, 1999).

Gustafson-Larson & Terry (1992) also found that body image concerns were more prevalent among females than males in their sample of 457 nine to 11 year old Caucasian children at 10 rural schools. They suggest this could be due to the fact that at this age girls begin to enter puberty when they often store more fat, therefore causing them to become more concerned about body weight. However, this study only looked at children between the ages of 9-11 and it is possible that these concerns are present at a much earlier age. Furthermore, the

results of this study cannot be generalized to the entire population, as it only included Caucasian children in a rural setting. They also reported that the children in this study had a higher BMI compared with a national sample of children.

O'Dea & Caputi (2001) found that body image and weight concerns are present as early as six years of age and that these concerns increase with age, especially in females. In this cross-sectional study 1131 participants in New South Wales, Australia ranging in age from 6-19, were tested. 466 of the participants were between the 6-12 years of age. This study used actual measures of height and weight (rather than self-report) and questionnaires were completed in the company of trained research assistants. A concerning finding of this study is that overweight boys were less likely than other boys or females to be trying to lose weight and were more likely to be trying to gain weight. Steen, Wadden, Foster & Andersen (1995), found results similar to this among a U.S sample. They found a high percentage of overweight boys (51%) were not trying to lose weight, yet among obese girls nearly all of them were trying to lose weight. The overweight boys perceived themselves to be less overweight than the overweight girls and were significantly happier with their looks. Body satisfaction among boys has been associated with large muscle mass, but it is unclear why overweight boys are not inclined to lose weight (Steen et al, 1995). Perhaps this is because males associate a larger size with strength and power. The cohort studied were grade 10 students who attended all-female and all-male high schools in northeast Philadelphia. Apart from 23 subjects, all were white

and the majority were from lower-middle to middle-class families. It would be interesting to determine if these trends are present at a younger age.

2.5 The Relationship between Motor Proficiency and Body Satisfaction

It is not difficult to imagine that children who are frustrated by their body's inability to move effectively might be more likely to be dissatisfied with their bodies as a whole. The relationship between motor proficiency and body image has been neglected in the literature. Apart from a single abstract by Hay et al. (2001) this relationship has not been examined in any report of the associations between physical activity and body mass with body satisfaction, or in reports of the associations between poor motor proficiency, body mass, and physical activity. It is possible that those with low motor proficiency may be at greater risk for low levels of body satisfaction due to lower levels of physical activity participation, generalized self-efficacy toward physical activity, and aerobic fitness, each of which increase the likelihood of overweight. The independent effect of motor proficiency on body satisfaction is unexamined.

Chapter III: Methods

3.1 Participants

This study made use of data from the Physical Health Activity Study Team (PHAST) study. The PHAST is an ongoing longitudinal study that began in 2004, when the participants were in Grade 4. The data for this particular study was taken from Wave 2 (2005) of the study. Grade 5 was chosen for this particular study because at this point the participants were familiar with, and competent in, completing the surveys, which should have led to fewer errors in completion. This is also a point in time where participants were unlikely to have reached puberty; therefore the effect of maturation is not a probable confounding variable. The PHAST study collected information from 2145 students (1090 males, 1055 females) in Year 2 from 75 of the 92 elementary schools in the District School Board of Niagara (DSBN) in Ontario, Canada. The 1907 (89.7%) participants with complete PHAST ID's, anthropometric measures, PQs, and Harter scales were included in the analyses.

Table 1: Sample Characteristics by gender in Grade 5

Variable	Males (n=971) (X ± SD)	Females (n=936) (X ± SD)	p-value
Age (yrs)	9.93(0.39)	9.92 (0.35)	0.41
BMI (kg/m ²)	19.11(3.67)	19.24(3.92)	0.42
Weight (kg)	40.39(9.92)	41.14(10.88)	0.11
Height (cm)	144.80(6.56)	145.49(7.60)	0.03*
Motor Proficiency Standard Score	57.95(11.88)	54.23(11.64)	<0.0001**
Body Satisfaction	16.20(1.92)	16.01(1.83)	0.03*

While at school, subjects underwent body composition appraisals and completed the Participation Questionnaire (PQ) and the Harter scale. Movement

skill appraisals using Bruininks-Oseretsky Test of Motor Proficiency (BOTMP-SF) were conducted on 25 randomly selected schools each year until all 75 schools had been tested.

Table 2: The sample sizes included for each variable considered and the year of PFAST testing the data was collected

Variables Considered	Year 1 (2004) Subject Numbers	Year 2 (2005) Subject Numbers	Year 3 (2006) Subject Numbers
Anthropometric Testing		1907 (971 M, 936 F)	
Participation Questionnaire/ Harter Scale		1907 (971 M, 936 F)	
Movement Skills Appraisal	630 (319 M, 311 F)	670 (338 M, 332 F)	607 (314 M, 293 F)

MacInnis (2008) found motor proficiency to be quite stable over time. The motor proficiency of 89 individuals was tested on two separate occasions between 12-24 months apart. A correlation of $r=0.70$ was found, indicating a moderate to good relationship, in spite of a large time difference and testing by different individuals. Therefore, no corrective measures were implemented in the present study for those students whose assessments took place in grade 4 or in grade 6.

3.2 Development of the Total Body Satisfaction Questionnaire

As there is no gold standard for measuring body satisfaction, the Total Body Satisfaction Questionnaire (TBSQ) was developed using an orthogonal varimax rotation factor analysis. Questionnaires completed by participants of the PHAST study were examined for any items that may relate to one's body satisfaction. 12 items were initially selected that were thought to relate to body satisfaction.

These 12 items include questions 4, 6, 10, 16, 18, 22, 24, 30, and 34 from the Harter scale and questions 61, 62, and 63 from the PQ (Appendix D).

The Harter scale is a self-report measure that provides a profile of the child's perceived competence and self-worth. The scale contains 28 items that measure the four facets of perceived competence: cognitive competence in school, social competence with peers, physical competence in sports, and general self-worth. Children indicate their feelings using a four-point Likert scale. This decreases the child's tendency to give socially desirable responses. This scale is suitable for use with elementary and junior high school students (Harter, 1982). The test-retest reliability of this scale is .78-.87 over 9 months (Byrne & Schneider, 1988).

The Participation Questionnaire (PQ) (Hay, 1992) has been used to estimate the amount of participation in physical activity and the type of participation in three categories: free time activity, organized sport, and total activity participation. The PQ is a 61-item form that contains multiple choice, Likert-scale type, and free response questions. This test has excellent test-re-test correlations: 0.81 for elementary school and 0.89 for high school students. The

PQ also includes three items that address body satisfaction and the desire to loose or gain weight.

Body satisfaction will be assessed using one question from the participation questionnaire and six questions from the Harter scale. The final seven items included in the TBSQ were:

- Some kids wish their body was different BUT other kids like their body the way it is
- Some kids are happy with themselves as a person BUT other kids are often not happy with themselves
- Some kids wish their physical appearance was different BUT other kids like their physical appearance they way it is
- Some kids like the kind of person they are BUT other kids often wish they were someone else
- Some kids are very happy being the way they are BUT other kids wish they were different
- Some kids think that they are good looking BUT other kids think that they are not very good looking
- Circle the answer that best describes how you like the way your body looks

A lot A little Not at all Hate how I look

3.3 Body Mass Index (BMI)

Participants had height measured to the nearest 0.1cm with a SECA 214 portable stadiometer. Children were instructed to stand straight with their chin held up. Weight was measured to the nearest 0.1kg using a calibrated Tanita BWB-300 electronic medical scale. Children wore loose clothing without shoes to collect these anthropometric variables. BMI was then calculated (weight (kg)/height (m²). Normative data (Cole et al., 2000) was used to categorize participants as overweight or healthy weight. In all analyses a '0' indicates that the child is overweight and a '1' was assigned to those who are healthy weight.

3.4 Motor Proficiency

The Bruininks-Oseretsky Test of Motor Proficiency-Short Form (BOTMP-SF) was used to determine motor proficiency (Appendix F). The test was administered separately to each child in the gymnasium. The BOTMP-SF has been validated against the long form with inter-correlations between 0.90 and 0.91 for children between the ages of 8 to 14 (Bruininks, 1978). The BOTMP-SF is composed of 14 items taken from the 8 subtests, which assess gross motor development, gross and fine motor development, and fine motor development. The short form is ideal to use when a large number of people must be tested and provides an assessment of general motor proficiency. However, it does not provide a detailed analysis of each aspect (Hay, Hawes & Faught, 2003). Low motor proficiency was defined as a standard score (age-adjusted) below 38 or below the 10th percentile (Cairney, Hay, Faught, Corna, & Flouris, 2006). Those

with low motor proficiency were represented with a '0' in all analyses and those with no motor challenge were represented with a '1'.

3.5 Statistical Analyses

This study defined body satisfaction using the Total Body Satisfaction Questionnaire. Participants were classified as satisfied or dissatisfied based on their score from the TBSQ. A higher score indicated greater body satisfaction. Participants were categorized as dis-satisfied (0) if their score on the TBSQ was two or more standard deviations below the mean; otherwise they were categorized as satisfied (1).

Descriptive statistics examined the distribution and characterization of all variables of interest in numerical format. A one-way ANOVA was used to determine whether body satisfaction scores differ between those with low motor proficiency and those with no motor challenges. Pearson product moment correlations were used to determine relationships between independent variables and correlations between each independent variable and body satisfaction (Appendix B). Logistic regressions were used to explore the association between motor proficiency, BMI, and body satisfaction. Logistic regressions were first used to determine two separate relationships: motor proficiency and body satisfaction; and overweight status and body satisfaction. Motor proficiency was considered as both a continuous and categorical variable. Overweight status was entered as a categorical variable and BMI as a continuous variable. Motor proficiency and body satisfaction were then entered into the same model in order to determine if motor proficiency is associated with body satisfaction,

independent of overweight status. Odds ratios determined the strength of the association of having low body satisfaction based on one's motor proficiency and overweight status. Logistic regression models were adjusted for age. Distal factors that may be associated with body satisfaction were not considered in the analyses.

Body satisfaction is commonly statistically different between males and females. Once this difference was confirmed in this cohort, the analyses were stratified by gender. A one-way ANOVA determined if body satisfaction differs between males and females to a statistically significant degree. Statistical significance for all analyses was set at a level of $p < 0.05$.

Chapter IV: Results

4.1 Sample Characteristics

Of the original 2245 individuals with available data from the PHAST study, a total of 1907 individuals (971 males, 936 females) with complete PHAST data were included in the final analyses.

Sample characteristics by motor proficiency are summarized in Table 3. Significant differences were observed between the case and non-case group in age (years) (10.04 ± 0.37 vs. 9.91 ± 0.39 , $p < 0.0001$), BMI (kg/m^2) (21.90 ± 5.14 vs. 18.95 ± 3.57 , $p = 0.0001$), and body satisfaction score (15.78 ± 1.78 vs. 16.14 ± 2.13). See Appendix D for complete results of the analysis of variance by motor proficiency.

Table 3: Sample Characteristics by motor proficiency in Grade 5

Variable	Low MP (n=146) (X \pm SD)	Normal MP (n=1696) (X \pm SD)	p-value
Age (yrs)	10.04(0.37)	9.91(0.39)	<0.0001**
BMI (kg/m^2)	21.90(5.14)	18.95(3.57)	<0.0001**
Weight (kg)	47.26(14.56)	40.22(9.80)	<0.0001**
Height (cm)	145.76(7.89)	145.09(7.03)	0.27
Body Satisfaction	15.78(1.86)	16.14(2.13)	0.03*

Significant differences were also observed between males with low motor proficiency and males with normal motor proficiency and between females with low motor proficiency and females with normal motor proficiency (Table 4). Significant differences were observed in age, BMI, height, and weight between males with low motor proficiency and those with normal motor proficiency. Between females with low motor proficiency and females with normal motor proficiency, significant differences were found in age, BMI, and weight.

Table 4: Sample Characteristics by Gender and Motor Proficiency in Grade 5

Variable	Males			Females		
	Low MP (n=60)	No Motor Challenges (n=911)	p-value	Low MP (n=86)	No Motor Challenges (n=850)	p-value
Age (years)	10.03 (0.45)	9.93 (0.34)	0.04*	10.04 (0.30)	9.91 (0.36)	0.0005*
BMI (kg/m ²)	22.31 (5.65)	18.89 (3.41)	<0.0001*	21.62 (4.77)	19.00 (3.74)	<0.0001 *
Height (cm)	146.62 (7.34)	144.68 (6.48)	0.03*	145.16 (8.24)	145.52 (7.54)	0.67
Weight (kg)	48.59 (15.11)	39.85 (9.24)	<0.0001*	46.33 (14.17)	40.62 (10.36)	<0.0001 *
Body Satisfaction	15.66 (2.10)	16.24 (1.90)	<0.03*	15.86 (2.15)	16.03 (1.79)	0.42

All subsequent analyses were stratified by gender, as significant differences in body satisfaction were found between males and females (16.20 ± 1.92 vs. 16.01 ± 1.92 , $p=0.03$) (Table 1). A two-way analysis of variance revealed there is not a significant interaction between body satisfaction, gender, and motor proficiency.

4.2 Factor Analysis

As a first step in developing the Total Body Satisfaction Questionnaire, a varimax orthogonal rotation factor analysis was performed on 12 items thought to be associated with body satisfaction (Appendix D). This initial factor analysis revealed two factors. Factor 1 was concerned with an individual's satisfaction with their body, whereas factor 2 measured their satisfaction with all aspects of themselves as a person. Items that showed factorial complexity (loadings within 0.5) were removed. These items included Harter questions 4, 6 and 10. A series of factor analyses were then performed using only those items that loaded solely on the body satisfaction factor (Factor 1). Factor analyses were run for the whole sample and for males and females separately. Following this process, items with gender complexity and scaling complexity were removed. These items included questions 61 and 62 from the PQ. This resulted in a one factor solution consisting of seven items: questions 16, 18, 22, 24, 30, and 34 from the Harter scale and question 63 from the PQ (Appendix E). This final solution demonstrated no complexity and the scaling was similar across the seven items. Below (Table 5) are the eigenvalues after varimax rotation for each item:

Table 5: Eigenvalues

Factor Number	Eigenvalue
1	3.48
2	0.27
3	0.07
4	-0.02
5	-0.08
6	-0.11
7	-0.12

Only factors with an eigenvalue over 1.0 are kept in the analysis, therefore there is a one factor solution in this analysis. Table 6 displays the factor loadings after varimax rotation, which demonstrates that all seven items “load” primarily on factor 1:

Table 6: Factor Loadings

Variables	Factor 1
H16	0.79
H18	-0.62
H22	0.78
H24	-0.69
H30	-0.77
H34	-0.64
PQ63	-0.63

Communalities between each item and the factor were also examined. Communality determines the proportion of the variance within each item accounted for by the factor. The seven items in the TBSQ displayed communalities ranging from 0.41-0.62. Each item has moderate communality, indicating they are measuring distinct aspects of the same factor. This result indicates little need for item reduction but does suggest that each item is required for a full appreciation of the factor. The communalities after varimax rotation are presented in Table 7:

Table 7: Communalities

Variables	Factor 1	Communality
H16	0.62	0.62
H18	0.38	0.38
H22	0.61	0.61
H24	0.48	0.48
H30	0.59	0.59
H34	0.41	0.41
PQ63	0.39	0.39

A correlation matrix of the seven items is displayed below, providing an approximation of the internal consistency of the TBSQ. Moderate correlation is desirable, as this indicates that the seven items are indeed tapping into the same factor. Each is measuring an aspect of a single factor while not so highly correlated as to be redundant. Correlation among the seven items ranges from 0.40-0.73 and are displayed in Table 8.

Table 8: Item Correlation Matrix

Variables	H16	H18	H22	H24	H30	H34	PQ63
H16	1	-0.44	0.73	-0.49	-0.57	-0.49	-0.51
H18	-0.44	1	-0.41	0.51	0.53	0.36	0.38
H22	0.73	-0.41	1	-0.48	-0.57	-0.51	-0.51
H24	-0.49	0.51	-0.48	1	0.61	0.44	0.40
H30	-0.57	0.53	-0.57	0.61	1	0.48	0.43
H34	-0.49	0.36	-0.51	0.44	0.48	1	0.46
PQ63	-0.51	0.38	-0.51	0.40	0.43	0.46	1

In summary, the resultant TBSQ consists of seven items, each with four possible responses. The highest score possible is 28, which indicates excellent body satisfaction.

4.3 Logistic Regression Results

The results of the logistic regression analyses are presented in Tables 9-23.

The association of motor proficiency in individuals who are overweight and healthy weight was examined. Children were grouped as overweight or normal-weight (Cole et al., 2000), and as low motor proficiency (BOTMP-SF score <38) or normal motor proficiency (BOTMP-SF score >38).

Multiple logistic regressions determined that there was a significant relationship between body satisfaction and overweight status (categorical or continuous) for both genders when adjusted for age (Tables 9 and 10). Overweight females were less likely to be satisfied with their bodies (OR: 0.33, CI: 0.23-0.47). The same trend was found in overweight males (OR: 0.42, CI: 0.29-0.59).

Table 9: Odds ratio of body satisfaction for overweight in Grade 5 by sex

Variable	Female		Male	
	OR (95% CI)	Chi-Square	OR (95% CI)	Chi-Square
Overweight(Categorical)	0.33 (0.23-0.47)**	36.99	0.42 (0.29-0.59)**	23.3
Age	0.78 (0.46-1.32)	0.87	0.66 (0.41-1.06)	2.92

**Significant at $p < 0.001$

Table 10: Odds ratio of body satisfaction for overweight in Grade 5 by sex

Variable	Female		Male	
	OR (95% CI)	Chi-Square	OR (95% CI)	Chi-Square
Overweight (Continuous)	0.88 (0.85-0.92)**	36.85	0.91 (0.87-0.95)**	19.51
Age	0.81 (0.48-1.37)	0.63	0.69 (0.43-1.11)	2.34

**Significant at p<0.001

A significant association was found between motor proficiency as a continuous standard score and body satisfaction when adjusted for age among males and females (Table 11). When motor proficiency was considered as a categorical variable (low motor proficiency or normal motor proficiency), it remained significant for males only (Table 12).

Table 11: Odds ratio of body satisfaction for motor proficiency (MP) in Grade 5 by sex

Variable	Female		Male	
	OR (95% CI)	Chi-Square	OR (95% CI)	Chi-Square
MP Standard Score (Continuous)	1.02 (1.00-1.04)**	6.47	1.02 (1.00-1.03)**	6.52
Age	0.83 (0.49-1.39)	0.52	0.72 (0.45-1.15)	1.89

**Significant at p<0.001

Table 12: Odds ratio of body satisfaction for motor proficiency (MP) in Grade 5 by sex

Variable	Female		Male	
	OR (95% CI)	Chi-Square	OR (95% CI)	Chi-Square
Low MP (Categorical)	0.83 (0.47-1.48)	0.39	0.45 (0.25-0.82)**	6.88
Age	0.79 (0.47-1.33)	0.81	0.72 (0.45-1.14)	1.99

**Significant at p<0.001

For males, a significant relationship between body satisfaction and motor proficiency was observed regardless of overweight status (OR: 0.53, CI: 0.29-0.97) when overweight status and motor proficiency were both considered as categorical variables (Table 13).

Table 13: Odds ratio of body satisfaction for overweight and motor proficiency in Grade 5 by sex

Variable	Female		Male	
	OR (95% CI)	Chi-Square	OR (95% CI)	Chi-Square
Overweight (Categorical)	0.33 (0.23-0.47)**	36.62	0.44 (0.31-0.63)**	20.08
Low MP(Categorical)	1.06 (0.59-1.92)	0.04	0.53 (0.29-0.97)*	4.28

*Significant at p<0.05

**Significant at p<0.001

Among males, poor motor proficiency is significantly associated with low body satisfaction regardless of overweight status (OR: 0.53; CI: 0.29-0.97). This relationship was not significant among females.

When adjusted for age, motor proficiency no longer remains a significant contributor to body satisfaction for males, although it does approach significance with a p-value of 0.056 (Table 14).

Table 14: Odds ratio of body satisfaction for overweight and motor proficiency in

Variable	Female		Male	
	OR (95% CI)	Chi-Square	OR (95% CI)	Chi-Square
Overweight (Categorical)	0.33 (0.23-0.47)*	36.73	0.44 (0.31-0.63)*	20.48
Low MP (Categorical)	1.10 (0.61-2.00)	0.01	0.55 (0.30-1.02)	3.65
Age	0.77 (0.45-1.31)	0.93	0.69 (0.43-1.11)	2.38

*Significant at p<0.001

Significant differences in weight were found between males under 11 years-old and those who had already turned 11 during the Grade 5 school year (Table 15). Significant differences in BMI were found between females under 11 years-old and those who had already turned 11 (Table 16).

Table 15: Differences in height and weight by age among males in Grade 5

Variable	10 years-old	11 years-old	p-value
	(n=929)	(n=42)	
Height (cm)	144.71 (6.47)	146.86 (7.93)	0.24
Weight (kg)	40.31 (9.83)	42.14 (11.77)	0.03*
BMI (kg/m2)	19.09 (3.79)	19.25(3.74)	0.79

*Significant at p<0.05

Table 16: Differences in height and weight by age among females in Grade 5

Variable	10 years-old	11 years-old	p-value
	(n=913)	(n=23)	
Height (cm)	145.41(7.58)	148.48(8.05)	0.16
Weight (kg)	41.03(10.78)	45.83(14.12)	0.06
BMI (kg/m2)	19.21(3.91)	20.38(4.34)	0.04*

*Significant at p<0.05

Table 17: Odds ratio of body satisfaction for overweight and motor proficiency for 10-year old children in Grade 5

Variable	Female		Male	
	OR (95% CI)	Chi-Square	OR (95% CI)	Chi-Square
Overweight (Categorical)	0.32 (0.22-0.48)**	32.07	0.44 (0.30-0.66)**	16.79
Low MP (Categorical)	1.08 (0.58-2.03)	0.06	0.49 (0.25-0.95)*	4.47

*Significant at p<0.05
 **Significant at p<0.001

When BMI and motor proficiency were entered as continuous variables, motor proficiency was not significantly associated with body satisfaction for either males or females, regardless of adjustment for age (Tables 18-23).

Table 18: Odds ratio of body satisfaction for overweight and motor proficiency in Grade 5

Variable	Female		Male	
	OR (95% CI)	Chi-Square	OR (95% CI)	Chi-Square
Overweight (Continuous)	0.88 (0.84-0.92)*	36.62	0.92 (0.88-0.96)*	15.05
Low MP (Categorical)	1.16 (0.63-2.13)	0.24	0.59 (0.32-1.11)	2.67

*Significant at p<0.001

Table 19: Odds ratio of body satisfaction for overweight and motor proficiency in Grade 5 adjusted for age

Variable	Female		Male	
	OR (95% CI)	Chi-Square	OR (95% CI)	Chi-Square
Overweight (Continuous)	0.88 (0.84-0.92)*	36.67	0.92 (0.88-0.96)*	15.08
Low Motor Proficiency (Categorical)	1.19 (0.65-2.21)	0.34	0.62 (0.33-1.16)	2.26
Age	0.79 (0.47-1.35)	0.74	0.71 (0.44-1.14)	24.19

*Significant at p<0.001

Table 20: Odds ratio of body satisfaction for overweight and motor proficiency in Grade 5

Variable	Female		Male	
	OR (95% CI)	Chi-Square	OR (95% CI)	Chi-Square
Overweight (Categorical)	0.35 (0.24-0.50)*	31.81	0.45 (0.31-0.65)*	17.64
MP Standard Score (Continuous)	1.01 (0.99-1.03)	1.52	1.01 (0.99-1.03)	2

*Significant at p<0.001

Table 21: Odds ratio of body satisfaction for overweight and motor proficiency in Grade 5 adjusted for age

Variable	Female		Male	
	OR (95% CI)	Chi-Square	OR (95% CI)	Chi-Square
Overweight (Categorical)	0.34 (0.24-0.49)*	31.94	0.45 (0.31-0.65)*	18.26
MP Standard Score (Continuous)	1.01 (0.99-1.03)	1.29	1.01 (0.99-1.03)	1.55
Age	0.80 (0.47-1.37)	0.65	0.68 (0.42-1.09)	2.49

*Significant at p<0.001

Table 22: Odds ratio of body satisfaction for overweight and motor proficiency in Grade 5

Variable	Female		Male	
	OR (95% CI)	Chi-Square	OR (95% CI)	Chi-Square
Overweight (Continuous)	0.89 (0.85-0.93)*	30.68	0.92 (0.88-0.96)*	13.26
MP Standard Score (Continuous)	1.01 (0.99-1.02)	0.89	1.01 (0.99-1.03)	1.29

*Significant at p<0.001

Table 23: Odds ratio of body satisfaction for overweight and motor proficiency in Grade 5 adjusted for age

Variable	Female		Male	
	OR (95% CI)	Chi-Square	OR (95% CI)	Chi-Square
Overweight (Continuous)	0.88 (0.85-0.93)*	30.73	0.92 (0.87-0.96)*	13.49
MP Standard Score (Continuous)	1.01 (0.99-1.02)	0.76	1.01 (0.99-1.02)	1.01
Age	0.83 (0.49-1.40)	0.5	0.71 (0.44-1.13)	2.07

*Significant at p<0.001

Chapter V: Discussion

The main objective of this study was to examine the association between motor proficiency and body satisfaction in male and female children and to determine if motor proficiency plays an independent role in reported body satisfaction. The association of motor proficiency on body satisfaction among those who are overweight was examined. The relationships between motor proficiency and BMI and between BMI and body satisfaction have been well documented (Graf et al., 2004). However, the association between motor proficiency and body satisfaction had previously been largely unexplored.

As the key outcome of interest of this study was body satisfaction, and since no gold standard of measuring this factor exists, particularly for children, the development of the Total Body Satisfaction Questionnaire (TBSQ) was vital. While limited to the items previously included in the PHAST project, a sufficient number of items similar to those used in existing questionnaires allowed the development and testing of this instrument to proceed.

The TBSQ was found to be a reasonable measure of body satisfaction for both males and females. The resultant scale demonstrated strong face validity, a strong single factor solution, and displayed reasonable internal consistency with little need for item reduction. That males reported higher body satisfaction than females and that overweight children experienced greater dissatisfaction than healthy weight children is consistent with the literature and provides evidence of construct validity. Taken together, these provide an acceptable level of evidence

for the validity of this measure and allow a reasonable level of confidence in its employment as a measure of body satisfaction in this report.

Body satisfaction and its association with a lower BMI in both males and females is widely supported in the literature (Sujoldzie & De Lucia, 2007; Davison, 2003; Rolland, Farnill & Griffiths, 1996). As expected, the present study found that both overweight boys and girls are to be less-satisfied with their bodies than their healthy weight counterparts.

Significant differences in body satisfaction were found between the group with low motor proficiency and the group with no motor challenges. Low motor proficiency was also found to be significantly associated with low body satisfaction for males when adjusted for overweight status (OR: 0.53, CI: 0.29-0.97). A probable explanation for this is the importance of performing well in physical activity that is placed on young males; young females are less likely to have the same degree of societal expectation in this regard. As has been established in prior research, males with low motor proficiency most likely feel they are inadequate and different compared to their peers as a result of their diminished physical activity performance. By the same token females with low motor proficiency do not have substantially lower feelings of inadequacy than their more accomplished peers as they are generally not expected to be involved in or to perform well in physical activities. When adjusted for age, overweight status remained significant for males and females, but motor proficiency did not remain significant for males. However, it did continue to approach significance (OR: 0.55, CI: 0.30-1.02, $p < 0.06$), indicating that a strong association remains

between motor proficiency and body satisfaction among males. Differences in weight were found between those boys who were still 10 years old in Grade 5 at the time of testing and the boys who had already turned 11 (40.31 ± 9.83 vs. 42.14 ± 11.77 , $p=0.03$). It is likely that the significance of the relationship between motor proficiency and body satisfaction decreased when adjusted for age due to the collinear relationship between age and BMI. Indeed, boys who were already age 11 at the time of testing were taller and significantly heavier than their younger classmates. As noted earlier, boys who are taller and heavier tend to report higher levels of body satisfaction. As all children are in the same grade, but were born at different times during the birth year, older boys, with as much as a year more to grow and develop, may be more satisfied than their younger, smaller peers in the same grade and social group.

A probable explanation for finding the significant association between motor proficiency and body satisfaction among boys is that they feel they have been betrayed by their bodies both in what they are expected to look like and what they are expected to be able to do. When they are not able to perform in physical activities at the same level as their peers they may feel inadequate. Females do not have the same societal expectations in terms of skill, which may explain why this relationship was not significant among females. Having low motor proficiency may not have as much affect on their body satisfaction as it does for males.

These findings point to the need for an understanding of the full challenges faced by those with low motor proficiency, particularly among males.

It appears that boys with low levels of motor proficiency are at particular risk of having low levels of body satisfaction. Apart from the burden that this fact alone implies, it also puts them at an increased risk for depression, low self-esteem, and eating disorders. The psychological toll on these children is substantial. There is a need to recognize this concern in the development of health promotion campaigns to reduce overweight. Children in Grade 5 with poor motor competence are at greater risk of overweight largely due to their withdrawal from physically active choices. Programs that highlight their overweight status and promote physical activity as a means to address the issue may well have a very negative impact on these children. They have learned to believe that they are 'no good' at sports and that active play is a source of ridicule and embarrassment. If these are promoted as means to address their overweight status they will have been placed in an impossible position. Programs that highlight more life-long activities, and family-based activities and which de-emphasize accomplishment and competition are more likely to be fruitful.

5.1 Study Limitations

The TBSQ has not been fully established for reliability and validity. However, initial findings display an acceptable level of confidence in this measure.

Self-reported data is subject to concerns over social desirability biases. The questions from the PQ and the Harter scale that were used to develop the Total Body Satisfaction Questionnaire were on self-report questionnaires. It

should be noted that this bias would tend to lower the estimates of low body satisfaction and hence would work against finding relationships.

5.2 Study Delimitations

This study is cross-sectional. Therefore, changes in those factors that predict body satisfaction at different ages cannot be determined. Being limited to a Grade 5 cohort in the Niagara Region limits generalization to other age groups and geographical regions.

Further, this report examines only the relationships between motor proficiency and body satisfaction controlling for overweight and age. No attempt is made to uncover the mechanisms by which low motor proficiency has an influence on body satisfaction.

Chapter VI: Conclusions

These findings confirm that motor proficiency is associated with body satisfaction in male children. It is evident that overweight is strongly associated with body satisfaction for both males and females, yet motor proficiency is also associated with body satisfaction in males regardless of overweight status.

As there are differences in the factors associated with body satisfaction between males and females in Grade 5, programs designed to increase body satisfaction must be tailored to each gender. It is also essential to consider the needs of children in this age range with low motor proficiency, particularly among boys, when developing health promotion initiatives that encourage a healthy weight and increased physical activity.

The TBSQ is a seven item questionnaire measuring a child's satisfaction with their body. Reasonable consistency was displayed in a correlation matrix and moderate communalities were found between each item and the factor, which are both desirable findings. Upon further investigation, the reliability and validity of this measure can be more fully established.

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Appendix A

BMI Charts

Table 24: Cut-off points for body mass index for overweight and obesity by sex between 8 and 11 years of age.

Age (years)	Overweight		Obese	
	Males	Females	Males	Females
8	18.44	18.35	21.60	21.57
9	19.10	19.07	22.77	22.81
10	19.84	19.86	24.00	24.11
11	20.55	20.74	25.10	25.42

(Cole et al., 2000)

Table 25: BMI-for-age weight status categories and the corresponding percentiles

Weight Status Category	Percentile Range
Underweight	Less than the 5 th percentile
Healthy Weight	5 th percentile to less than the 85 th percentile
At risk of overweight	85 th percentile to less than the 95 th percentile
Overweight	Equal to or greater than the 95 th percentile

Appendix B

Pearson Correlations

Table 26: Pearson correlations of various independent variables in Grade5 of PHAST

	BMI (kg/m²)	Height (cm)	Weight (kg)	MP	Body Satisfaction
BMI (kg/m²)		0.35 <0.0001	0.93 <0.0001	0.06 0.14	-0.18 <0.0001
Height (cm)	0.35 <0.0001		0.66 <0.0001	-0.03 0.2737	-0.07 0.0041
Weight (kg)	0.93 <0.0001	0.66 <0.0001		-0.18 <0.0001	-0.17 <0.0001
MP	-0.31 <0.0001	-0.03 0.2737	-0.18 <0.0001		0.05 0.0209
Body Satisfaction	-0.18 <0.0001	-0.07 0.0041	-0.17 <0.0001	0.05 0.0209	

Appendix C

ANOVA-Sample Characteristics by Gender in Grade 5

Dependent Variable: Age

Source	DF	Sum of Squares	Mean Square	F Value	Pr>F
Model	1	0.09	0.09	0.7	0.4
Error	1905	260.77	0.14		
Corrected Total	1906	260.87			

R-Square	Coeff Var	Root MSE	Age Mean
0.00037	3.73	0.37	9.93

Source	DF	ANOVA SS	Mean Square	F Value	Pr>F
Gender	1	0.09	0.09	0.7	0.4

Dependent Variable: BMI

Source	DF	Sum of Squares	Mean Square	F Value	Pr>F
Model	1	9.23	9.23	0.64	0.42
Error	1905	27452	14.41		
Corrected Total	1906	27461.2			

R-Square	Coeff Var	Root MSE	BMI Mean
0.00034	19.79	3.79	19.17

Source	DF	ANOVA SS	Mean Square	F Value	Pr>F
Gender	1	9.23	9.23	0.64	0.42

Dependent Variable: Weight

Source	DF	Sum of Squares	Mean Square	F Value	Pr>F
Model	1	270.01	270.01	2.49	0.11
Error	1905	206226	108.26		
Corrected Total	1906	206496			

R-Square	Coeff Var	Root MSE	Weight Mean
0.00131	25.52	10.4	40.76

Source	DF	ANOVA SS	Mean Square	F Value	Pr>F
Gender	1	270.01	270.01	2.49	0.11

Dependent Variable: Height

Source	DF	Sum of Squares	Mean Square	F Value	Pr>F
Model	1	227.99	227.99	4.53	0.03
Error	1905	95812.9	50.29		
Corrected Total	1906	96040.9			

R-Square	Coeff Var	Root MSE	Height Mean
0.00237	4.89	7.09	145.14

Source	DF	ANOVA SS	Mean Square	F Value	Pr>F
Gender	1	227.99	227.99	4.53	0.03

Dependent Variable: MP Standard Score

Source	DF	Sum of Squares	Mean Square	F Value	Pr>F
Model	1	6591.41	6591.41	47.6	<0.0001
Error	1905	263776	138.46		
Corrected Total	1906	270368			

R-Square	Coeff Var	Root MSE	MP Mean
0.02438	20.97	11.77	56.12

Source	DF	ANOVA SS	Mean Square	F Value	Pr>F
Gender	1	6591.41	6591.41	47.6	<0.0001

Dependent Variable: Body Satisfaction

Source	DF	Sum of Squares	Mean Square	F Value	Pr>F
Model	1	17.42	17.42	4.94	0.03
Error	1905	6720.33	3.53		
Corrected Total	1906	6737.75			

R-Square	Coeff Var	Root MSE	BS Mean
0.00259	11.66	1.88	16.1

Source	DF	ANOVA SS	Mean Square	F Value	Pr>F
Gender	1	17.42	17.42	4.94	0.03

Appendix D

ANOVA-Sample Characteristics by Motor Proficiency in Grade 5

Dependent Variable: Age

Source	DF	Sum of Squares	Mean Square	F Value	Pr>F
Model	1	2.05	2.05	15.12	0.0001
Error	1905	258.81	0.14		
Corrected Total	1906	260.86			

R-Square	Coeff Var	Root MSE	Age Mean
0.007874	3.71	0.37	9.93

Source	DF	ANOVA SS	Mean Square	F Value	Pr>F
MP	1	2.05	2.05	15.12	0.0001

Dependent Variable: BMI

Source	DF	Sum of Squares	Mean Square	F Value	Pr>F
Model	1	1180.63	1180.63	85.58	<0.0001
Error	1905	26280.58	13.79		
Corrected Total	1906	27461.21			

R-Square	Coeff Var	Root MSE	BMI Mean
0.04	19.37	3.71	19.17

Source	DF	ANOVA SS	Mean Square	F Value	Pr>F
MP	1	1180.63	1180.63	85.58	<0.0001

Dependent Variable: Weight

Source	DF	Sum of Squares	Mean Square	F Value	Pr>F
Model	1	6681.44	6681.44	63.7	<0.0001
Error	1905	199814.75	104.88		
Corrected Total	1906	206496.19			

R-Square	Coeff Var	Root MSE	Weight Mean
0.03	25.12	10.24	40.76

Source	DF	ANOVA SS	Mean Square	F Value	Pr>F
MP	1	6681.41	6681.44	63.7	<0.0001

Dependent Variable: Height

Source	DF	Sum of Squares	Mean Square	F Value	Pr>F
Model	1	60.4	60.4	1.2	0.2737
Error	1905	95980.45	50.38		
Corrected Total	1906	96040.85			

R-Square	Coeff Var	Root MSE	Height Mean
0.000629	4.89	7.09	145.14

Source	DF	ANOVA SS	Mean Square	F Value	Pr>F
MP	1	60.4	60.4	1.2	0.2737

Dependent Variable: Body Satisfaction

Source	DF	Sum of Squares	Mean Square	F Value	Pr>F
Model	1	16.93	16.93	4.8	0.03
Error	1905	6720.82	3.53		
Corrected Total	1906	6737.75			

R-Square	Coeff Var	Root MSE	BS Mean
0.002512	11.66	1.88	16.11

Source	DF	ANOVA SS	Mean Square	F Value	Pr>F
MP	1	16.93	16.93	4.8	0.03

Appendix E

Overview of PHAST study

The Physical Health Activity Study Team (PHAST) is a longitudinal and comprehensive study of children that began in the fall of 2004. The multi-disciplinary team involved with the project from Brock University includes John Hay, John Cairney (adjunct), and Brent Faught of the Department of Community Health Sciences; Frances Owen of the Department of Child and Youth Studies; James Mandigo of the Department of Physical Education and Kinesiology; Cheryl Missiuna from the school of Rehabilitation Sciences at McMaster University; and Ron Lopez from the District School Board of Niagara (DSBN).

The PHAST study is a five-year, wide-scale comprehensive study ultimately studying motor proficiency. At the beginning of the study, 2245 students took part in fitness and body composition appraisals. They also completed three questionnaires about physical activity levels and each individual's self-perceptions of adequacy in predilection for physical activity, and self-esteem levels. Each year, starting when the DSBN participants were in grade 4, they were tested two times (two waves) during the fall and spring of the school year.

For the present cross-sectional study, Year 2, Wave 2 data was selected as the best data set to be used. At this time, participants are familiar with and competent in completing the surveys, which may lead to fewer errors in completion. This is also an age where participants are unlikely to have reached puberty; therefore, the effect of maturation does not need to be taken into

account. The majority of the data utilized will be from Year 2, Wave 2 of the PHAST study, with the exception of the movement skill appraisals, which were collected from 25 different schools each year, over 3 years. Research has found that children with motor proficiency are unlikely to outgrow their condition (Cairney et al., 2006). As well, MacInnis (2008) found motor proficiency to be quite stable over time. A correlation of $r=0.70$ was found, indicating a moderate to good relationship.

Appendix F
Initial Items Included in the Factor Analysis

Harter 4

Some kids are happy with the way they look

BUT

Other kids are not happy with the way they look

Harter 6

Some kids are often unhappy with themselves

BUT

Other kids are pretty pleased with themselves

Harter 10

Some kids are happy with their height and weight

BUT

Other kids wish their height and weight were different

Harter 16

Some kids wish their body was different

BUT

Other kids like their body the way it is

Harter 18

Some kids are happy with themselves as a person

BUT

Other kids are often not happy with themselves

Harter 22

Some kids wish their physical appearance (how they look) was different

BUT

Other kids like their physical appearance the way it is

Harter 24

Some kids like the kind of person they are

BUT

Other kids often wish they were someone else

Harter 30

Some kids are very happy the way they are

BUT

Other kids wish they were different

Harter 34

Some kids think that they are good looking

BUT

Other kids think that they are not very good looking

PQ 61

Check the answer that best describes how you feel about your body.

Very	Somewhat	Just the	Somewhat	Very
underweight	underweight	right weight	overweight	overweight

PQ 62

Check the answer that best describes how you would change your body.

Lose a lot	Lose a	Stay	Gain a	Gain a lot
of weight	little weight	the same	little weight	of weight

PQ 63

Check the answer the best describes how you like the way your body looks.

A lot	A little	Not at all	Hate how I look
-------	----------	------------	-----------------

Factor Analysis Report-All

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Descriptive Statistics Section

Variables	Count	Mean	Standard Deviation	Communality
H4	2075	1.647229	0.8638713	0.626660
H6	2075	3.331084	0.8699264	0.373132
H10	2075	1.790361	0.9464462	0.446400
H16	2075	3.137831	1.032402	0.658847
H18	2075	1.474217	0.7761421	0.354590
H22	2075	3.129157	1.01374	0.616649
H24	2075	1.502169	0.7809016	0.432067
H30	2075	1.580241	0.8382692	0.543130
H34	2075	1.963855	0.8920222	0.420652
PQ61	2075	3.053494	0.7527072	0.127901
PQ62	2075	3.348434	0.8124758	0.182749
PQ63	2075	1.676627	0.7782037	0.423764

Correlation Section

Variables	H4	H6	H10	H16	H18
H4	1.000000	-0.439264	0.549351	-0.628801	0.456013
H6	-0.439264	1.000000	-0.356627	0.504277	-0.450454
H10	0.549351	-0.356627	1.000000	-0.595620	0.355287
H16	-0.628801	0.504277	-0.595620	1.000000	-0.439037
H18	0.456013	-0.450454	0.355287	-0.439037	1.000000
H22	-0.610288	0.480186	-0.532598	0.732076	-0.414312
H24	0.477864	-0.489728	0.396935	-0.488390	0.513007
H30	0.570435	-0.469857	0.463945	-0.569362	0.532129
H34	0.547827	-0.403979	0.441626	-0.487258	0.362535
PQ61	0.313033	-0.155922	0.281737	-0.294906	0.134001
PQ62	0.346265	-0.193312	0.352118	-0.373433	0.165264
PQ63	0.584738	-0.374517	0.421805	-0.508624	0.383335

Phi=0.436865 Log(Det|R)=-5.493856 Bartlett Test=11367.70 DF=66 Prob=0.000000

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Correlation Section

Variables	Variables H22	H24	H30	H34	PQ61
H4	-0.610288	0.477864	0.570435	0.547827	0.313033
H6	0.480186	-0.489728	-0.469857	-0.403979	-0.155922
H10	-0.532598	0.396935	0.463945	0.441626	0.281737
H16	0.732076	-0.488390	-0.569362	-0.487258	-0.294906
H18	-0.414312	0.513007	0.532129	0.362535	0.134001
H22	1.000000	-0.478475	-0.565406	-0.505106	-0.276347
H24	-0.478475	1.000000	0.607953	0.441378	0.117515
H30	-0.565406	0.607953	1.000000	0.482652	0.176209
H34	-0.505106	0.441378	0.482652	1.000000	0.211132
PQ61	-0.276347	0.117515	0.176209	0.211132	1.000000
PQ62	-0.342097	0.180816	0.255911	0.232937	0.540319
PQ63	-0.505042	0.402227	0.432637	0.461720	0.261671

Phi=0.436865 Log(Det|R)=-5.493856 Bartlett Test=11367.70 DF=66 Prob=0.000000

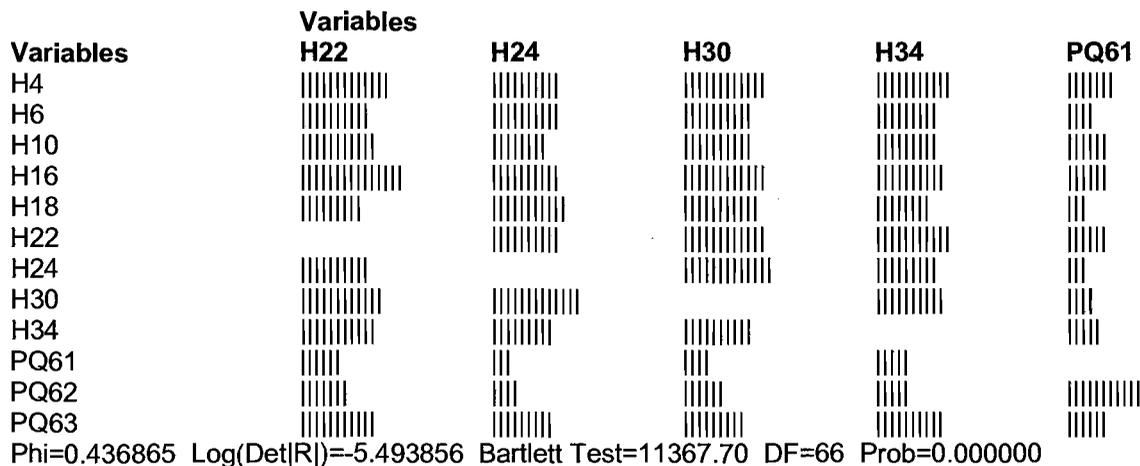
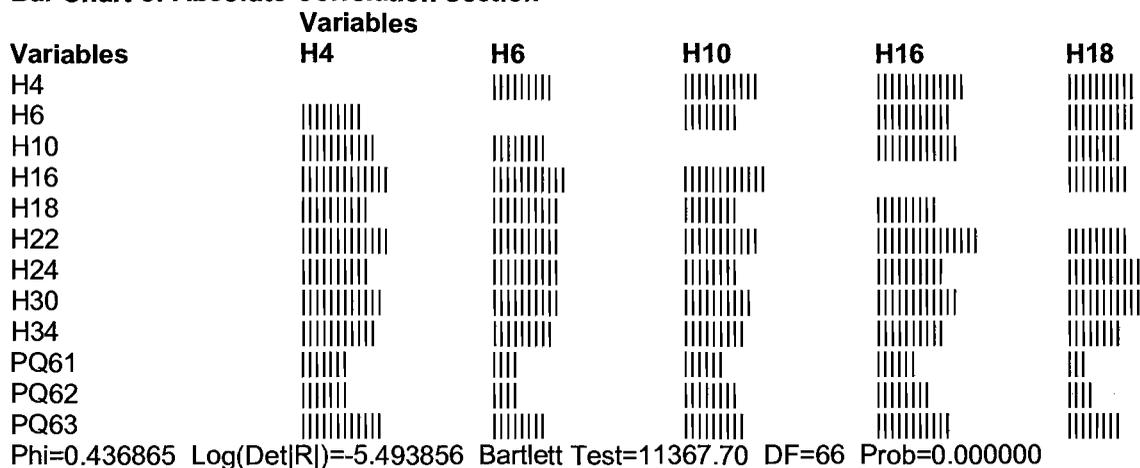
Variables	Variables PQ62	PQ63
H4	0.346265	0.584738
H6	-0.193312	-0.374517
H10	0.352118	0.421805
H16	-0.373433	-0.508624
H18	0.165264	0.383335
H22	-0.342097	-0.505042
H24	0.180816	0.402227
H30	0.255911	0.432637
H34	0.232937	0.461720
PQ61	0.540319	0.261671
PQ62	1.000000	0.296492
PQ63	0.296492	1.000000

Phi=0.436865 Log(Det|R)=-5.493856 Bartlett Test=11367.70 DF=66 Prob=0.000000

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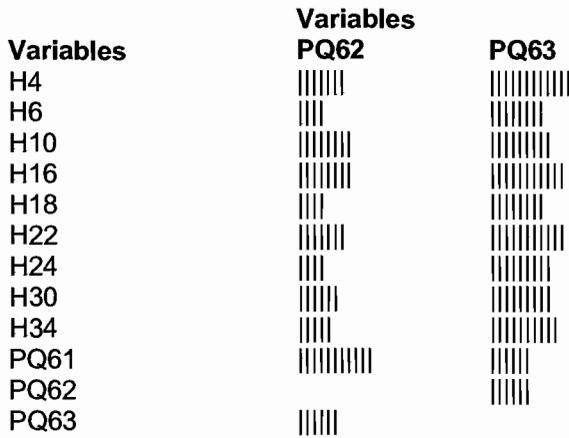
Bar Chart of Absolute Correlation Section



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Bar Chart of Absolute Correlation Section



Phi=0.436865 Log(Det|R)=-5.493856 Bartlett Test=11367.70 DF=66 Prob=0.000000

Eigenvalues after Varimax Rotation

No.	Eigenvalue	Individual Percent	Cumulative Percent	Scree Plot
1	5.206542	99.70	99.70	
2	0.625568	11.98	111.68	
3	0.154577	2.96	114.64	
4	0.135795	2.60	117.24	
5	0.018391	0.35	117.59	
6	-0.016877	-0.32	117.27	
7	-0.035559	-0.68	116.59	
8	-0.079860	-1.53	115.06	
9	-0.118208	-2.26	112.79	
10	-0.133951	-2.56	110.23	
11	-0.153261	-2.93	107.29	
12	-0.380878	-7.29	100.00	

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Eigenvectors after Varimax Rotation

Variables	Factors
	Factor1
H4	-0.346930
H6	0.267705
H10	-0.292811
H16	0.355728
H18	-0.260969
H22	0.344147
H24	-0.288072
H30	-0.322981
H34	-0.284241
PQ61	-0.156734
PQ62	-0.187350
PQ63	-0.285290

Bar Chart of Absolute Eigenvectors after Varimax Rotation

Variables	Factors
	Factor1
H4	
H6	
H10	
H16	
H18	
H22	
H24	
H30	
H34	
PQ61	
PQ62	
PQ63	

Factor Analysis Report-All

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Factor Loadings after Varimax Rotation

Variables	Factors
	Factor1
H4	-0.791619
H6	0.610845
H10	-0.668132
H16	0.811694
H18	-0.595474
H22	0.785270
H24	-0.657318
H30	-0.736974
H34	-0.648577
PQ61	-0.357633
PQ62	-0.427492
PQ63	-0.650971

Bar Chart of Absolute Factor Loadings after Varimax Rotation

Variables	Factors
	Factor1
H4	
H6	
H10	
H16	
H18	
H22	
H24	
H30	
H34	
PQ61	
PQ62	
PQ63	

Factor Analysis Report-All

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Communalities after Varimax Rotation

Variables	Factors	
	Factor1	Communality
H4	0.626660	0.626660
H6	0.373132	0.373132
H10	0.446400	0.446400
H16	0.658847	0.658847
H18	0.354590	0.354590
H22	0.616649	0.616649
H24	0.432067	0.432067
H30	0.543130	0.543130
H34	0.420652	0.420652
PQ61	0.127901	0.127901
PQ62	0.182749	0.182749
PQ63	0.423764	0.423764

Bar Chart of Communalities after Varimax Rotation

Variables	Factors	
	Factor1	Communality
H4		
H6		
H10		
H16		
H18		
H22		
H24		
H30		
H34		
PQ61		
PQ62		
PQ63		

Factor Analysis Report-Males

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Factor Loadings after Varimax Rotation

Variables	Factors Factor1
H4	-0.750708
H6	0.545073
H10	-0.574749
H16	0.777782
H18	-0.537933
H22	0.749392
H24	-0.617120
H30	-0.681775
H34	-0.555174
PQ61	-0.263138
PQ62	-0.342552
PQ63	-0.611368

Bar Chart of Absolute Factor Loadings after Varimax Rotation

Variables	Factors Factor1
H4	
H6	
H10	
H16	
H18	
H22	
H24	
H30	
H34	
PQ61	
PQ62	
PQ63	

Factor Analysis Report-Females

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Factor Loadings after Varimax Rotation

Variables	Factors
	Factor1
H4	-0.816749
H6	0.679407
H10	-0.741882
H16	0.840789
H18	-0.646710
H22	0.818373
H24	-0.695555
H30	-0.780565
H34	-0.723796
PQ61	-0.431419
PQ62	-0.491624
PQ63	-0.680828

Bar Chart of Absolute Factor Loadings after Varimax Rotation

Variables	Factors
	Factor1
H4	
H6	
H10	
H16	
H18	
H22	
H24	
H30	
H34	
PQ61	
PQ62	
PQ63	

Appendix G

Final Items Included in the Factor Analysis

Harter 16

Some kids wish their body was different

BUT

Other kids like their body the way it is

Harter 18

Some kids are happy with themselves as a person

BUT

Other kids are often not happy with themselves

Harter 22

Some kids wish their physical appearance (how they look) was different

BUT

Other kids like their physical appearance the way it is

Harter 24

Some kids like the kind of person they are

BUT

Other kids often wish they were someone else

Harter 30

Some kids are very happy the way they are

BUT

Other kids wish they were different

Harter 34

Some kids think that they are good looking

BUT

Other kids think that they are not very good looking

PQ 63

Check the answer the best describes how you like the way your body looks.

A lot

A little

Not at all

Hate how I look

Factor Analysis Report-All

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 Database C:\Users\Megen Del Ben\Documents\Thesis\megan1.S0
 Filter wave=4

Descriptive Statistics Section

Variables	Count	Mean	Standard Deviation	Communality
H16	2076	3.137283	1.032455	0.618103
H18	2076	1.474952	0.7766774	0.378499
H22	2076	3.128613	1.013799	0.607628
H24	2076	1.502409	0.7807899	0.478627
H30	2076	1.580925	0.8386462	0.590184
H34	2076	1.964355	0.8920971	0.411392
PQ63	2076	1.677264	0.7785581	0.394971

Correlation Section

Variables	H16	H18	H22	H24	H30
H16	1.000000	-0.439544	0.732235	-0.488537	-0.569701
H18	-0.439544	1.000000	-0.414857	0.513083	0.532869
H22	0.732235	-0.414857	1.000000	-0.478627	-0.565755
H24	-0.488537	0.513083	-0.478627	1.000000	0.607994
H30	-0.569701	0.532869	-0.565755	0.607994	1.000000
H34	-0.487574	0.363180	-0.505414	0.441548	0.483109
PQ63	-0.509023	0.384320	-0.505452	0.402430	0.433424

Phi=0.498086 Log(Det|R|)=-3.048999 Bartlett Test=6317.02 DF=21 Prob=0.000000

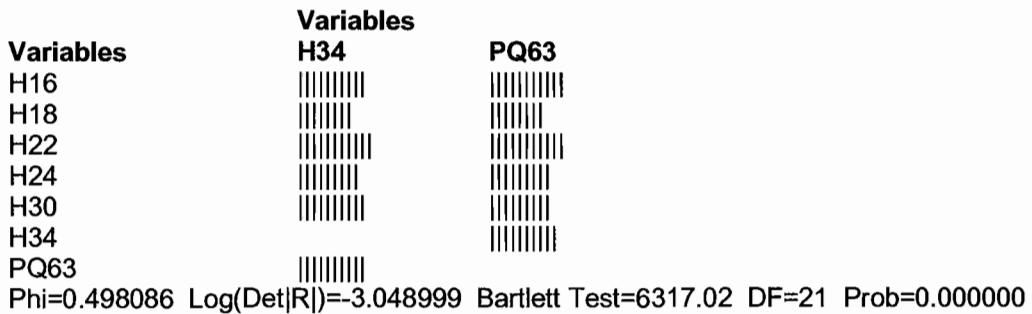
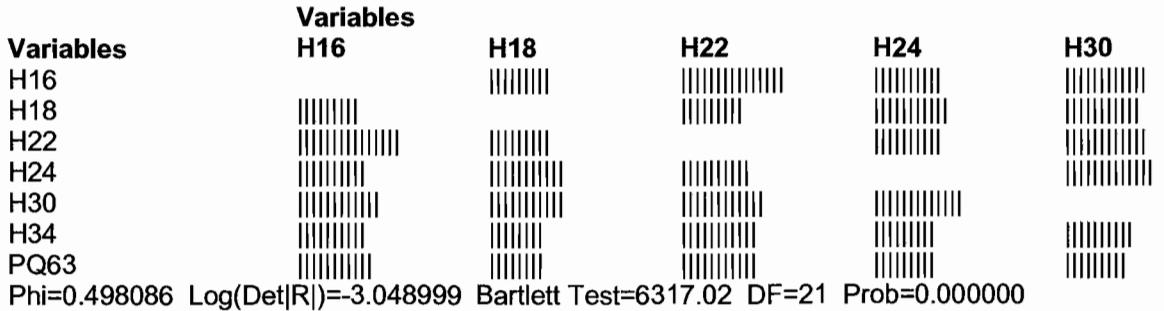
Variables	H34	PQ63
H16	-0.487574	-0.509023
H18	0.363180	0.384320
H22	-0.505414	-0.505452
H24	0.441548	0.402430
H30	0.483109	0.433424
H34	1.000000	0.462200
PQ63	0.462200	1.000000

Phi=0.498086 Log(Det|R|)=-3.048999 Bartlett Test=6317.02 DF=21 Prob=0.000000

Factor Analysis Report-All

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 Database C:\Users\Megen Del Ben\Documents\Thesis\megan1.S0
 Filter wave=4

Bar Chart of Absolute Correlation Section



Eigenvalues after Varimax Rotation

No.	Eigenvalue	Individual Percent	Cumulative Percent	Scree Plot
1	3.479403	100.00	100.00	
2	0.268308	7.71	107.71	
3	0.068235	1.96	109.67	
4	-0.022897	-0.66	109.01	
5	-0.083240	-2.39	106.62	
6	-0.107305	-3.08	103.54	
7	-0.123063	-3.54	100.00	

Factor Analysis Report-All

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 Database C:\Users\Megen Del Ben\Documents\Thesis\megan1.S0
 Filter wave=4

Eigenvectors after Varimax Rotation

Variables	Factors
	Factor1
H16	0.421481
H18	-0.329822
H22	0.417894
H24	-0.370891
H30	-0.411852
H34	-0.343855
PQ63	-0.336923

Bar Chart of Absolute Eigenvectors after Varimax Rotation

Variables	Factors
	Factor1
H16	
H18	
H22	
H24	
H30	
H34	
PQ63	

Factor Loadings after Varimax Rotation

Variables	Factors
	Factor1
H16	0.786195
H18	-0.615223
H22	0.779505
H24	-0.691829
H30	-0.768234
H34	-0.641399
PQ63	-0.628467

Factor Analysis Report-All

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 Database C:\Users\Megen Del Ben\Documents\Thesis\megan1.S0
 Filter wave=4

Bar Chart of Absolute Factor Loadings after Varimax Rotation

Variables	Factors
	Factor1
H16	
H18	
H22	
H24	
H30	
H34	
PQ63	

Communalities after Varimax Rotation

Variables	Factors	
	Factor1	Communality
H16	0.618103	0.618103
H18	0.378499	0.378499
H22	0.607628	0.607628
H24	0.478627	0.478627
H30	0.590184	0.590184
H34	0.411392	0.411392
PQ63	0.394971	0.394971

Bar Chart of Communalities after Varimax Rotation

Variables	Factors	
	Factor1	Communality
H16		
H18		
H22		
H24		
H30		
H34		
PQ63		

Factor Analysis Report- Males

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 Filter wave=4 and female=0

Eigenvectors after Varimax Rotation

Variables	Factors
	Factor1
H16	0.432475
H18	-0.318066
H22	0.431458
H24	-0.379010
H30	-0.417768
H34	-0.310768
PQ63	-0.332998

Bar Chart of Absolute Eigenvectors after Varimax Rotation

Variables	Factors
	Factor1
H16	
H18	
H22	
H24	
H30	
H34	
PQ63	

Factor Loadings after Varimax Rotation

Variables	Factors
	Factor1
H16	0.751152
H18	-0.552438
H22	0.749384
H24	-0.658290
H30	-0.725608
H34	-0.539762
PQ63	-0.578374

Factor Analysis Report-Females

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 Database C:\Users\Megen Del Ben\Documents\Thesis\megan1.S0
 Filter wave=4 and female=1

Eigenvectors after Varimax Rotation

Variables	Factors
	Factor1
H16	0.412245
H18	-0.339711
H22	0.408709
H24	-0.366060
H30	-0.405703
H34	-0.367205
PQ63	-0.337895

Bar Chart of Absolute Eigenvectors after Varimax Rotation

Variables	Factors
	Factor1
H16	
H18	
H22	
H24	
H30	
H34	
PQ63	

Factor Loadings after Varimax Rotation

Variables	Factors
	Factor1
H16	0.814070
H18	-0.670835
H22	0.807088
H24	-0.722867
H30	-0.801151
H34	-0.725128
PQ63	-0.667248

Appendix H

Bruininks-Oseretsky Test of Motor Proficiency-Short Form

INDIVIDUAL RECORD FORM

SHORT FORM

NAME _____ SEX: BOY GIRL GRADE _____
 SCHOOL _____ EXAMINER _____

Arm Preference: *(circle one)*

RIGHT LEFT MIXED

Day Month Year

Date Tested

Bioelectrical Impedance Analysis

HEIGHT: RESISTANCE: BODY FAT % :

	MAXIMUM SCORE	SUBJECT'S SCORE	STANDARD SCORE (Table 27)	PERCENTILE RANK (Table 27)	STANINE (Table 27)
SHORT FORM	98		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Short Form:

1. During test administration, record subject's response for each trial.
2. After test administration, convert performance on each item (item raw score) to a point score using scale provided. For an item with more than one trial, choose best performance. Record item point score in square to right of scale.
3. Add point scores for all 14 items and record total in Test Score Summary section. Consult Examiner's Manual for norms tables.

1. Running Speed and Agility

TRIAL 1: seconds TRIAL 2: seconds

Raw Score	Above 11.0	10.9-11.0	10.5-10.8	9.9-10.4	9.5-9.8	8.9-9.4	8.5-8.8	7.9-8.4	7.5-7.8	6.9-7.4	6.7-6.8	6.3-6.6	6.1-6.2	5.7-6.0	5.5-5.6	Below 5.5
Point Score	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

2. Standing on Preferred Leg on Balance Beam (10 seconds maximum per trial)

TRIAL 1: seconds TRIAL 2: seconds

Raw Score	0	1-2	3-4	5-6	7-8	9	10
Point Score	0	1	2	3	4	5	6

3. Walking Forward Heel-to-Toe on Balance Beam (6 steps maximum per trial)

TRIAL

--	--	--	--	--	--	--	--

 1: =.....steps TRIAL

--	--	--	--	--	--	--	--

 2: =.....steps

Raw Score	0	1-3	4	5	6
Point Score	0	1	2	3	4

4. Tapping Feet Alternately While Making Circles with Fingers (90 seconds maximum)

Raw Score	Fail	Pass
Point Score	0	1

5. Jumping Up and Clapping Hands

TRIAL 1: claps TRIAL 2: claps

Raw Score	0	1	2	3	4	Above 4
Point Score	0	1	2	3	4	5

6. Standing Broad Jump (record number from tape measure)

TRIAL 1: TRIAL 2: TRIAL 3:

Raw Score	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Point Score	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

7. Catching a Tossed Ball with Both Hands (5 trials)

NUMBER OF CATCHES:

Raw Score	0	1-2	3-4	5
Point Score	0	1	2	3

8. Throwing a Ball at a Target with Preferred Hand (5 trials)

= HITS

Raw Score	0	1-2	3-4	5
Point Score	0	1	2	3

9. Response Speed

	TRIAL	SECONDS TO WAIT	SCORE ¹	RANKED TRIAL SCORES ²
¹ Record number from response speed stick in this column. ² Rank all seven trial scores highest to lowest in boxes provided. The point score for Subtest 6 is the median (middle), or fourth score from the top.	Practice 1.....	1.....	XXXXX	HIGHEST <input type="checkbox"/> <input type="checkbox"/> MEDIAN <input type="checkbox"/> <input type="checkbox"/> LOWEST <input type="checkbox"/>
	Practice 2.....	3.....	XXXXX	
	1.....	2.....	_____	
	2.....	3.....	_____	
	3.....	1.....	_____	
	4.....	3.....	_____	
	5.....	2.....	_____	
6.....	1.....	_____		
	7.....	1.....	_____	

10. Drawing a Line Through a Straight Path with Preferred Hand

NUMBER OF ERRORS:

Raw Score	Above 6	6	2-5	1	0
Point Score	0	1	2	3	4

11. Copying a Circle with Preferred Hand

SCORE:

Raw Score	0	1	2
Point Score	0	1	2

12. Copying Overlapping Pencils with Preferred Hand

SCORE:

Raw Score	0	1	2
Point Score	0	1	2

13. Making Dots in Circles with Preferred Hand (15 seconds)

Raw Score	0	1-10	11-15	16-20	21-25	26-30	31-35	36-40	41-50	51-60	Above 60
Point Score	0	1	2	3	4	5	6	7	8	9	10

14. Sorting Shape Cards with Preferred Hand (15 seconds)

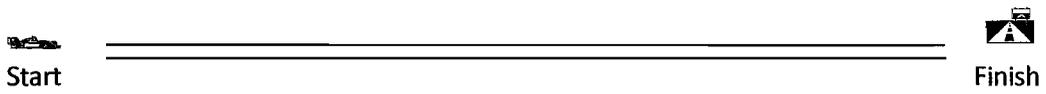
Raw Score	0	1-8	9-12	13-16	17-20	21-25	26-29	30-33	34-37	38-41	Above 41
Point Score	0	1	2	3	4	5	6	7	8	9	10

BIOELECTRICAL IMPEDANCE ANALYSIS

NOTES/OBSERVATIONS

Visual-Motor Control

Item 10: Drawing a Lint Through a Straight Path with Preferred Hand



Number of
Errors

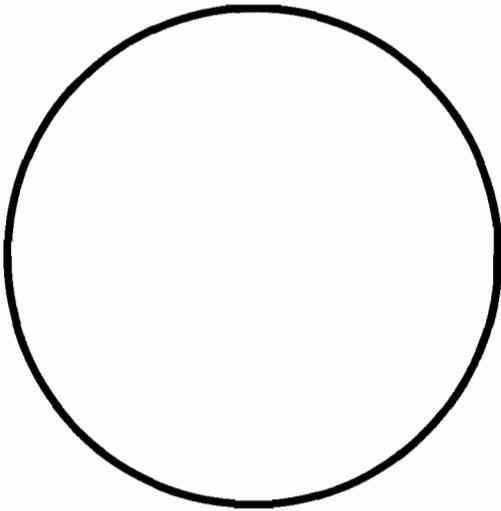
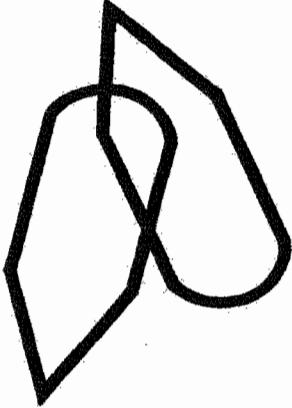
Visual-Motor Control

Item 11: Copying a Circle
Preferred Hand

with

Item 12: Copying Overlapping Pencils
Preferred Hand

with

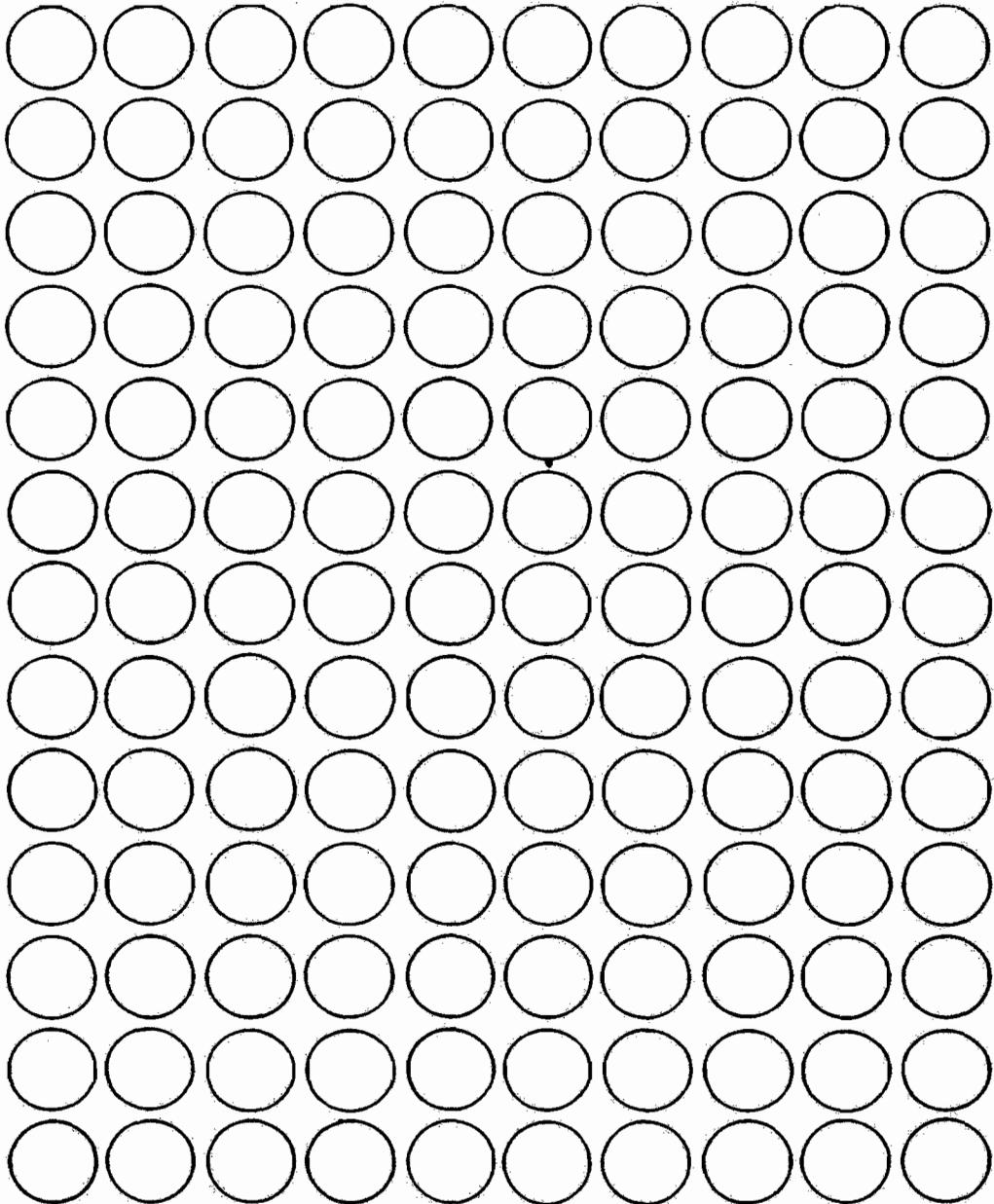
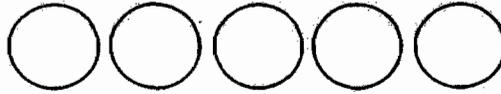
Score

Score

Upper-Limb Speed and Dexterity

Making Dots in Circles with Preferred Hand

Practice:



Number
Correct